

From MAPS IN MINDS

REFLECTIONS ON COGNITIVE MAPPING

R Downs & D Stea 1977 p 6-27

COGNITIVE MAPPING AND MAPS

Cognitive mapping is an abstraction covering those cognitive or mental abilities that enable us to collect, organize, store, recall, and manipulate information about the spatial environment. These abilities change with age (or development) and use (or learning). Above all, cognitive mapping refers to a process of doing: it is an activity that we engage in rather than an object that we have. It is the way in which we come to grips with and comprehend the world around us. The idea of a process or activity becomes clear if we list a range of everyday situations in which we make use of cognitive mapping: in learning the way from home to school (and back again) as a child; in planning a vacation trip; in deciding upon an efficient route for a multipurpose shopping trip; in searching for a new home; in getting to know a new town; in learning to be a taxi driver in London (or any other city).

A cognitive map is a product—a person's organized representation of some part of the spatial environment. Examples include a sketch map showing the route to your house; a list of the places downtown that you avoid because they are dangerous; a child's painting of his house and neighborhood; the picture that comes to mind every time you try to cross town on the subway system; and the travel brochure that describes places that are worth visiting. Most importantly, a cognitive map is a cross section representing the world at one instant in time. It reflects the world as some person believes it to be; it need not be correct. In fact, distortions are highly likely. It is your understanding of the world, and it may only faintly resemble the world as reflected in cartographic maps or color photographs. However, to get a better understanding of the nature of cognitive maps, we must focus on two key concepts from the definition and look at them in more detail. The key concepts are *representation* and *environment*.

In everyday usage, we think of a portrait of a person or a scale model of a building as representations; we speak of somebody making a representation on our behalf. Turning to the dictionary, we find that a representation stands for or symbolizes something; that it depicts or portrays something; that it can be a mental image or likeness or model. Our use of representation shares all of these characteristics. We are talking about something that stands for the environment, that portrays it, that is both a *likeness* and a *simplified model*, something that is, above all,

a *mental image* in a person's brain. These images are not necessarily visual in form since, as we will discuss in Chapter 3, blind people also construct mental images of their spatial environment. (The intriguing but complex issue of where and how such representations are formed in the brain will be treated in Chapter 6.) The cognitive map is clearly a representation in every sense of the word—in fact, if we break down the word so that it reads re-presentation, we have another clue. Cognitive mapping allows us to generate mental images and models of the environment, which are present again, which we can conjure up and think about almost at will.

However, we still face the question, Representation of what? Environment is now such an overused word that it has lost its precise meaning, and therefore we must specify what particular aspects of a person's environment are of interest to us. In the context of cognitive mapping, we mean the *everyday spatial environment*: everyday in the sense that it is the world that we interact with regularly and that serves as the normal setting for our activities. It includes schools, homes, the local shopping center, friends' houses, the pattern of streets and roads, beaches, picnic areas, restaurants, movie theaters, parking lots, and the doctor's office. These make up the stage or context for much of our everyday or normal behavior. These are important places that we use, need to know about, and therefore need to represent mentally.

In addition, the places that we have listed help us to understand the spatial part of our definition of the environment. We use schools, stores, parks, and so on, in everyday life and so we need to know their locations, how far away they are, what's there, how good they are, and how to get to them. Cognitive mapping is our way of acquiring and storing this essential information, of being able to use it to decide where to go and how to get there.

We can also see how our interest in the environment differs from that of other social sciences. Sociologists, and many social psychologists, might focus on a person's everyday social environment: the patterns of people and groups and organizations with which a person regularly comes into contact. Some sociologists are also interested in a much broader and inclusive definition of environment, which encompasses, for example, the type of school system a child attends, the family structure he grows up in, his friendship patterns, and the roles of books, television, and radio as they influence his attitudes and beliefs. Obviously, cognitive mapping is important in determining the overall course of a person's life, but sociologists and psychologists are primarily interested in many other aspects of the environment, and tend to ignore its *spatial* aspects.

If our discussion so far has seemed abstract, it must be emphasized that the ability we are trying to grapple with is literally (and metaphorically) down-to-earth. We can get a firmer appreciation by examining

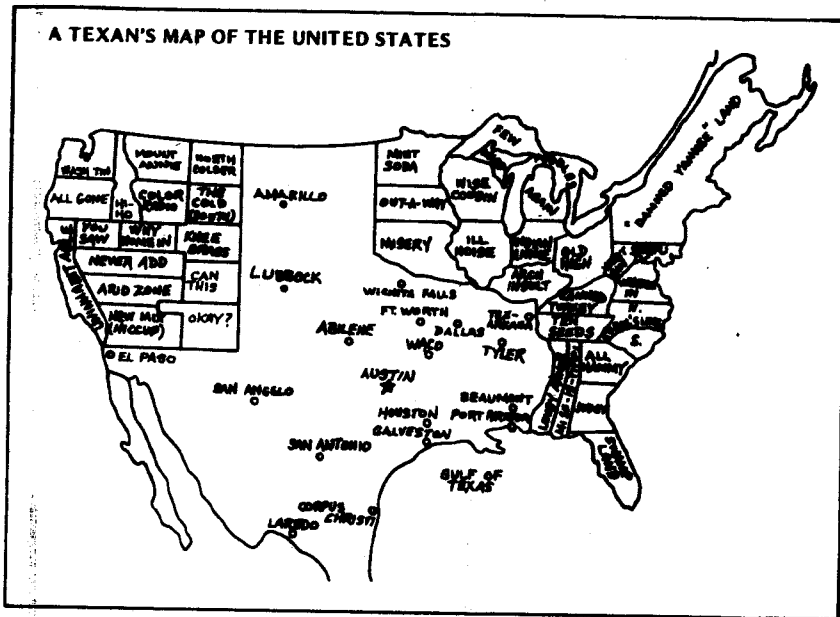


Figure 1.2. Humorous representations, 1: a Texan's view of the United States.

three different cognitive maps (see Figures 1.2, 1.3, and 1.4). Each depicts a cognitive representation of a country and is intended to be amusing: Each gets its humor from a different source. In the case of the Texan's map of the United States (Figure 1.2), there is a play on the spelling and pronunciation of the names of the states (Miss Again and Why Home In), and such regional biases as labelling all of the north-eastern states "Damned Yankee Land," and California as "uninhabitable" are evident. The Maritimer's view of Canada (Figure 1.3) places an extreme emphasis on the virtues of home. There is no place in the rest of Canada that can match it; the Maritimes, blessed by a smiling sun, are the home of the world's biggest, best, and finest. "Ye newe map of Britain" (Figure 1.4) pits cosmopolitanism against provincialism, civilization against backwardness. Of course, after laughing, a Texan or a Maritimer or a Londoner would claim that the maps are exaggerations, overstatements, and that they should not be taken too seriously.

But are they overstatements? We often admit that many a true word is spoken in jest, and such is the case with these three cognitive maps. If we look more carefully, and are not sidetracked by the humor, we notice that these maps depend for their success upon their approximation to the truth and contain, if not the whole truth, a good part of it. Each is an attempt to express something about the world—how

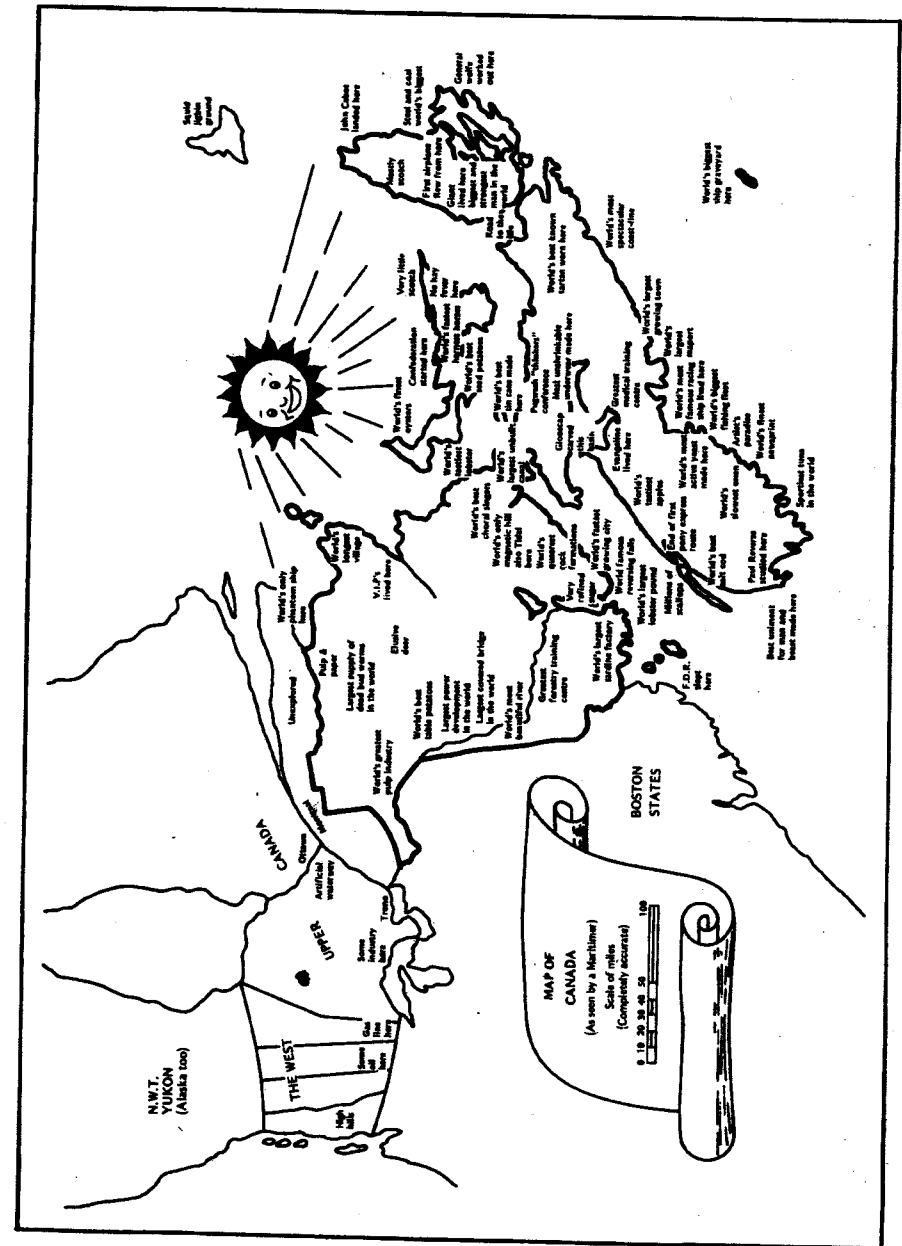


Figure 1.3. Humorous representations, 2: a Maritimer's view of Canada

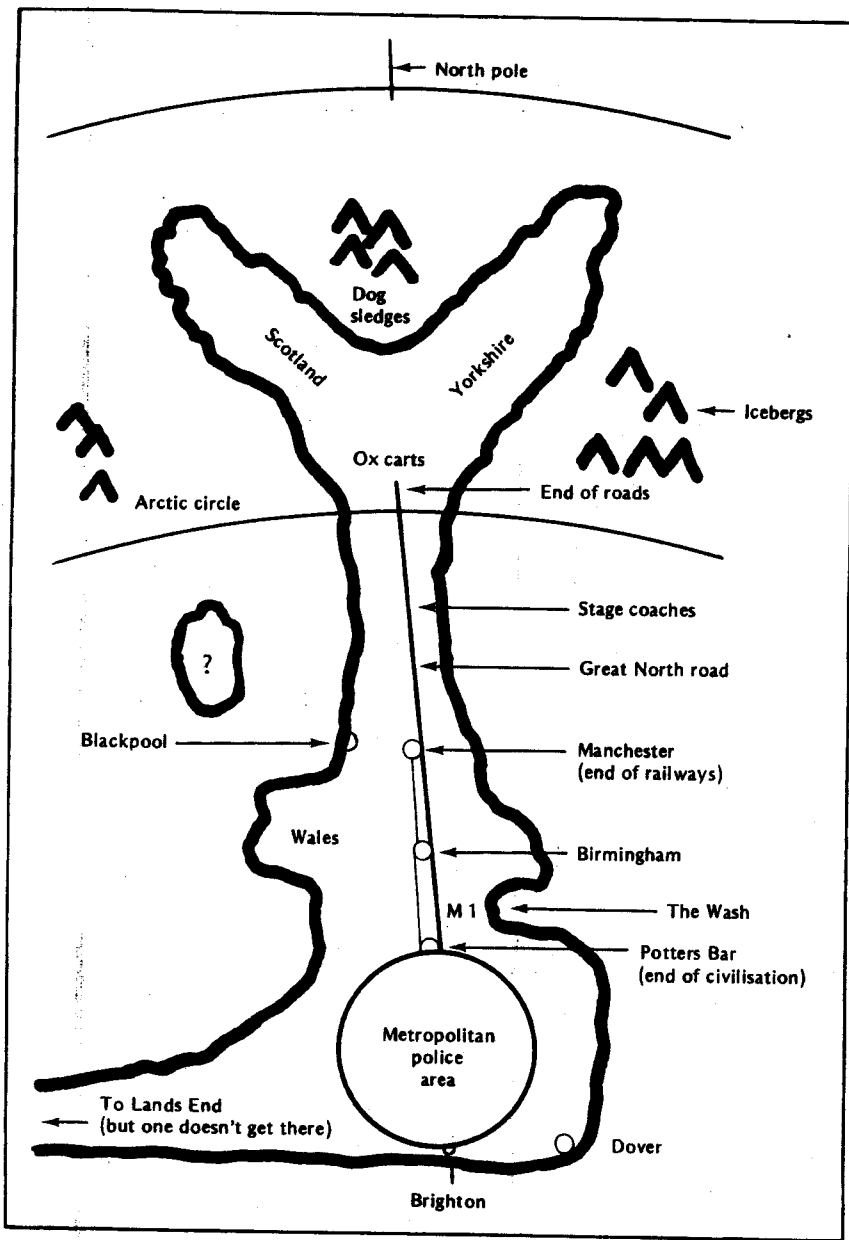


Figure 1.4. Humorous representations, 3: a Londoner's view of the north of Great Britain.

people react to and assess the world around them. These cognitive maps are not much like the cartographic atlas maps of the U.S.A., Canada, or Great Britain with which we are familiar. The shapes of the coastlines are twisted, the areas of the various states or regions are out of proportion, and the relative locations of places have been changed. Despite these alterations, the maps are easily recognized and readily understood. Each one reflects a regional bias to and parochial view of the world; each one compares the rest of the world with home, and finds the rest of the world wanting. The Texan's view echoes the joke that everything is bigger in Texas, expressed more appropriately in this case as, everything is big about Texas except the states that surround it! Texas looms larger than everywhere else in the U.S.A., an effect that is partly achieved by the annexation of a large part of Mexico. This cavalier disregard for national frontiers reflects an attitude which may partially explain why Texans were for many years the most unpopular tourists in Mexico. Such cartographic license is also employed to locate the Southwest Metroplex (Dallas/Fort Worth) "smack dab in the middle" of the U.S.A. (see Figure 1.5). The Londoner's view accen-

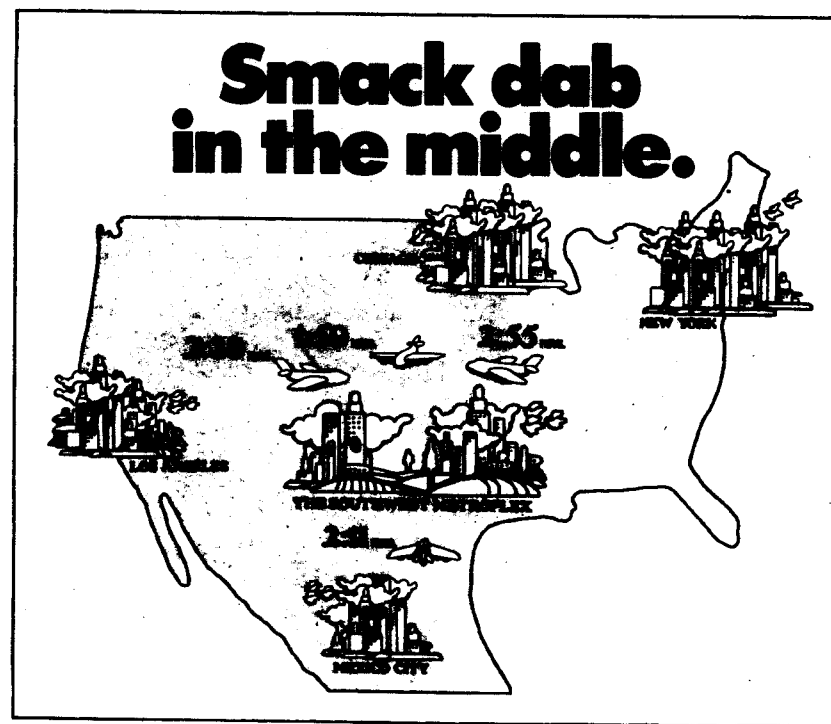


Figure 1.5. The importance of centrality.

tuates the positive aspects of the good life in the southeast of England and relegates the negative for everywhere to the north. Everything that matters in Canada is, in the view of at least one mapmaker, located in the Maritime Provinces.

In all three cases, we have a representation of a part of the world as a certain group of people believe it to be, expressing pride of place in the case of Texas and the Maritimes, and an Englishwoman's fear of the unknown area north of London. These examples are amusing, thought-provoking, truthful, and eye-catching, but they are scarcely sufficient evidence to support our claim that cognitive mapping is vitally important and that it is worthwhile writing (and reading) a whole book about cognitive maps.

WHY IS COGNITIVE MAPPING IMPORTANT?

Why is cognitive mapping important and worth studying? There is a range of answers to this question. In the remainder of this chapter we will present four answers and then briefly outline the organization of the book.

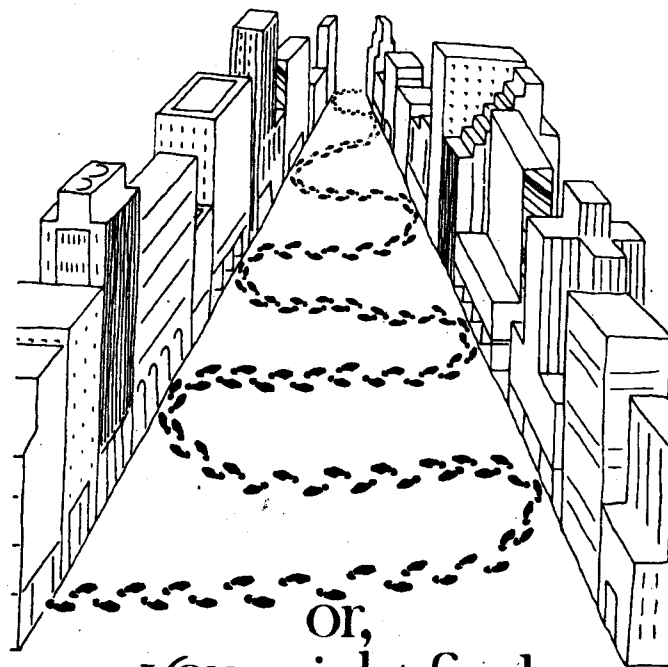
COGNITIVE MAPPING AND SPATIAL BEHAVIOR

The principal reason for attempting to understand cognitive mapping is that the world as we believe it to be serves as the basis for much of our everyday spatial behavior. Although the arguments behind this claim are reviewed in detail in Chapter 2, we can appreciate the importance of cognitive mapping if we look at some of the ways in which spatial behavior is dependent on the world as we believe it to be.

First, we rely upon organizing and manipulating our knowledge of the world in order to know where to get things and to find people. We need to find supermarkets for food, stores for clothing and furniture, doctors for medical treatment, friends for advice, and parks and beaches for relaxation. We have to know where these essential things are located. If we don't know where they are, we are either forced "to let our fingers do the walking," as the *Yellow Pages* telephone directory advises, or to waste a lot of valuable time and effort before we find what we are searching for (see Figure 1.6).

But it is not sufficient only to know where people and things are. A second role of our cognitive mapping ability is in telling us how to get there. Although we usually speak of astronauts, air crew, and ships' captains navigating, we also have to navigate around our own corner of the world. As the child in Figure 1.7 demonstrates, the ability to find the quickest way home is something that we learn the hard way. We all pride ourselves in getting to know our way around a place. This means learning all of the shortcuts, knowing the traffic bottlenecks to avoid in the rush hour, and keeping track of which streets are currently under repair. We are generally flattered to be asked to give directions al-

You might try
all of the other
brokerage firms in town
first...



or,
you might find
what you're looking for
by simply starting at—



Reynolds Securities Inc.

Figure 1.6. The Search, and how to avoid it.

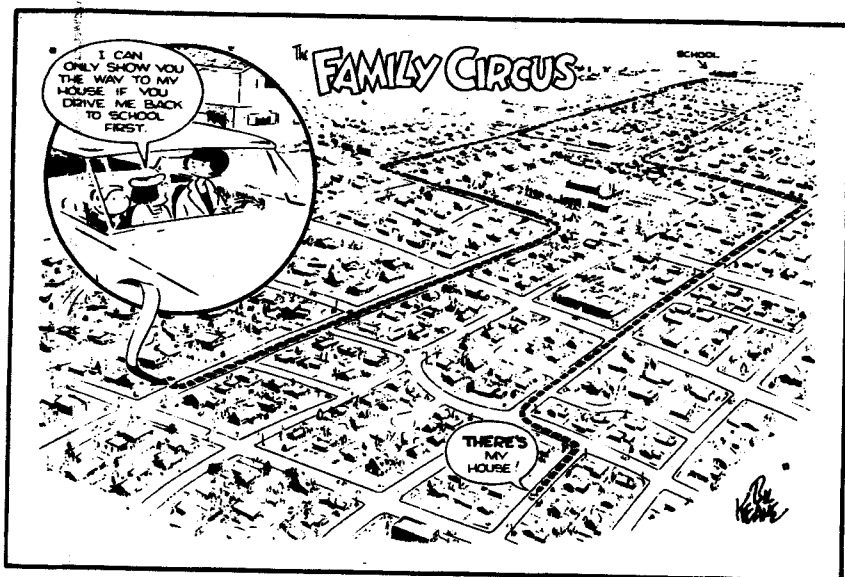


Figure 1.7. Knowledge of place and knowledge of routes are often intimately related.

though the lost stranger may not always value the advice after he has tried it out. Our environment is littered with signs, directions, and arrows to help us in wayfinding; tourist information centers and American Automobile Association offices help us to solve spatial problems. The Baedeker guide books, which were so popular with early twentieth century European travellers, have been replaced by oil company road maps, tour guides, and even tape-recorded cassettes for walking tours around museums and cities.

The widely felt need for assistance in wayfinding is reflected in this embittered assessment:

... it is virtually impossible to understand New York, to find out what is going on or how to get there. For some years I believed information was deliberately withheld—that New York was a game with all the cards stacked against the provincial, the tourist, the foreigner—so that only the strongest would survive. Now I know better. New York is simply the essence of the American Way, a triumph of the spirit of Free Enterprise.

(New York, 1972, p. 84)

And when free enterprise steps in to fill the information gap, the public response is overwhelming:

Give the people what they want, charge nothing and business will boom. The Transit Authority discovered this yesterday when it began to give

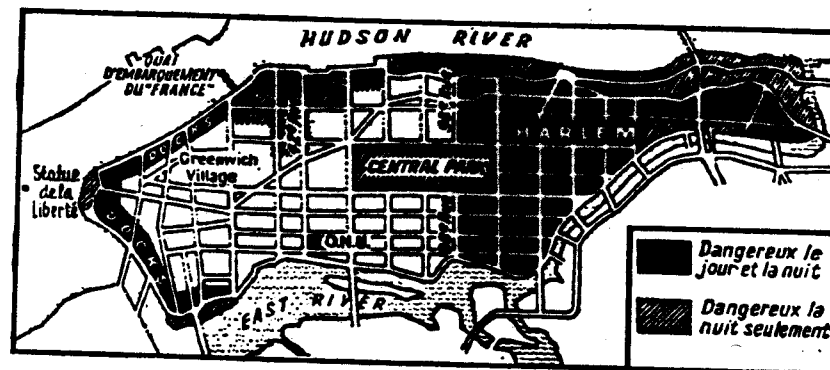


Figure 1.8. Residential and touristic undesirability: New York City is a place of fear and wonder to many visitors, fraught with fascination and dread. To the tourist equipped with this map, it appears even more frightening. The shaded areas are considered dangerous both night and day, the black areas during the night.

away new pocket-size subway maps and found that the demand of strap-hangers quickly exhausted the supply of many token-vending booths around the city.

* * *

A spokesman for the Transit Authority said all booths would be restocked with maps as rapidly as possible. The authority has printed 1.5 million copies of the new maps, but the spokesman said there were no figures available on the number distributed yesterday.

(The New York Times, August 8, 1972, p. 37)

There is more to wayfinding than knowing the shortest or easiest route. A tourist intent on sight-seeing would prefer the most picturesque and historic route. However, a tourist might also be advised to take heed of the warning contained in the French newspaper, *L'Aurore*. Urban crime, muggings, and gang harassment have reached such a level that both visitors and city dwellers need to know where it is safe to be and to walk, night and day. For this reason, *L'Aurore* published a street map of Manhattan (see Figure 1.8) showing potential French tourists where it was unsafe both day and night, or night only. Yet such maps of safety are not just advisable for tourists to the city. David Ley (1972) interviewed residents of an inner-city neighborhood in Philadelphia about the location of dangerous places: street corners, alleys, bars, and so on. Figure 1.9 is an aggregate mapping of their responses, showing areas of high potential danger as peaks on a stress surface. Patterns of movement within the neighborhood carefully avoid these acknowledged danger points. The shortest route, in terms of physical distance or time, is not necessarily the best if it's not safe.

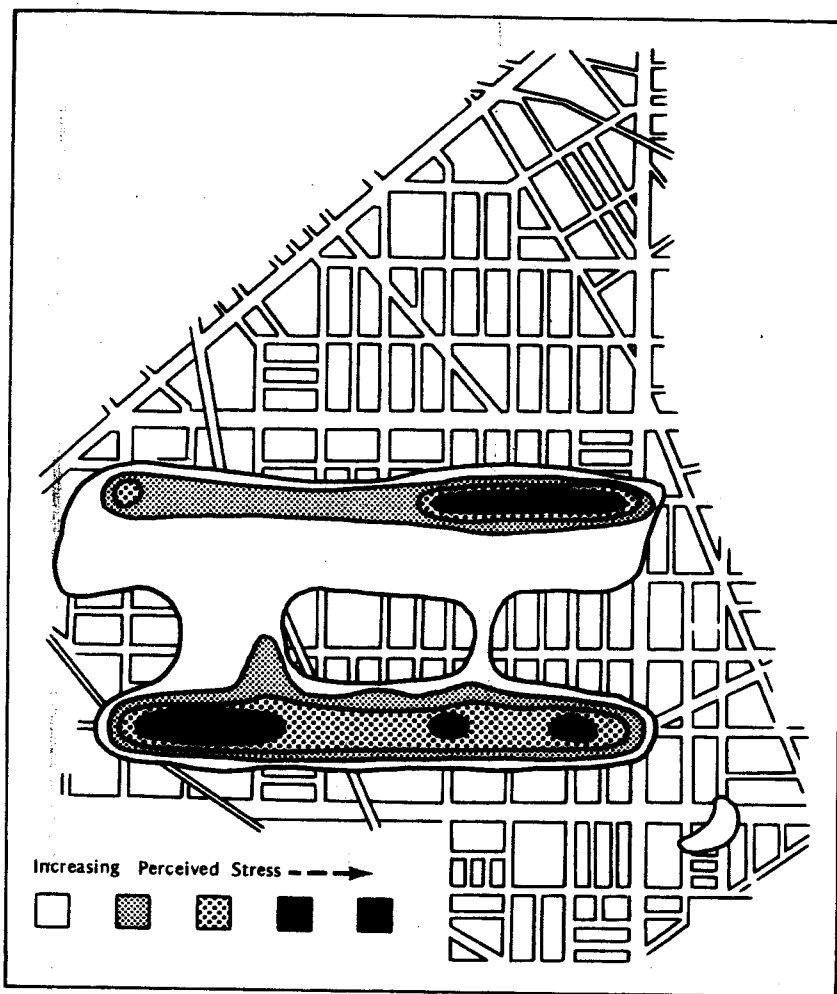


Figure 1.9. The dangerous areas of Monroe, a neighborhood of Philadelphia.

So far, we have seen that cognitive mapping tells us where to get things, and how to get there quickly, easily, and safely. A third role lies in telling us where to locate our basic activities: shopping centers, offices, factories, and, in particular, our homes. Given the increasing rates of social and spatial mobility that all Western societies are witnessing, the choice of a place to live is more than ever a true choice. Constraints of family ties, work place, and housing supply are of decreasing importance. The question, *Where would you like to live?* is far more meaningful, and cognitive mapping helps us to answer it. We choose be-

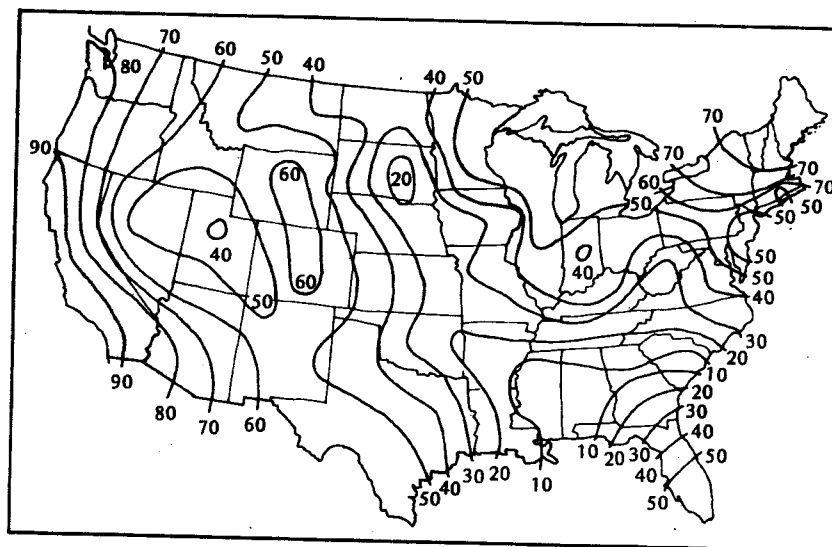


Figure 1.10. Residential desirability, 1: where California students would like (and not like) to live.

tween parts of the country, cities within a region, neighborhoods within a city, and houses within a neighborhood. We sort out in our minds the good and the bad, attractive and unattractive, desirable and undesirable, at all spatial scales.

On a national scale, Peter Gould (1966) has shown how U.S. college students view the states of the U.S.A. as potential places to live. Figure 1.10 is a map of the collective viewpoint of a group of students in California. Scores for each state range from 100 in California itself (the most desirable) to 0 in Alabama (the least desirable). The contour lines indicate the relative level of desirability and form a surface of peaks and valleys. Although we cannot claim that hypothetical questions (*where would you like to live if you had complete freedom?*) asked of college students give a representative picture, the surface does make intuitive sense. We have the same home bias shown in the Texas and Maritimes maps; there are regional stereotypes that color responses to the South and the Midwest; recreation or resort states like Maine or Florida are high spots of attraction. The residential desirability surface is one reflection of cognitive mapping at work.

However, long-distance moves are an uncertain undertaking, and uncertainty leads to worry and fear. Are we making the right decision? Homeric, a nationally advertised company, can ease the burden:

We specialize in taking the risk out of relocating. Relocating and buying a home in a strange area is a big step and a misstep could prove extremely

costly. At Homeric we take the time, tension, and chance out of relocating. Counseling families and helping them to select the right neighborhood and home in an unfamiliar area is our business.

For those hardy people who prefer to rely upon their own cognitive mapping skills, a recent book can offer some assistance. *Safe Places*, by David and Holly Franke (1972), is a carefully researched discussion of 46 of the safest communities in the U.S.A.:

To help you decide which of these communities is the right one for you, the authors knocked on doors in every town . . . They sifted fact from fiction, reality from wishful thinking, saving you months—even years—of beating the bushes for a Safe Place of your own. The authoritative information they uncovered—warts and all—is carefully organized to help you make up your mind before you call the moving man and make your escape.

Within a city, we are all acutely aware of the status distinctions between various areas. We dichotomize areas according to whether they are on the right side of the tracks or not. There are fine differentiations on the right side of the tracks between “Nob Hill” or the “Golden Ghetto.” The fashionable places to live are well known and envied: It is desirable to have the “right” address. A recent article in *The Los Angeles Times* (March 19, 1972) carries this folk geography one step further, and offers a social map of “beautiful people places” in Los Angeles. The article also reveals the power of suggestion in determining the social ins and outs of the city:

What labels a place “socially desirable” is not totally explainable: views, gates, protection, high real estate values, clean air, schools, proximity to ocean/hills, chic shops—these can all play a part. On the other hand, areas with none of these to offer attract top Los Angeles leaders. Maybe Beautiful People buy where other Beautiful People buy, or buy where they think they buy.

The social and economic structure of the city is crucial knowledge not only to people seeking homes, but also to businessmen making investment decisions involving stores, offices, and factories. At the heart of all of these decisions is the real estate market. A cognitive map of areas of investment opportunity is essential for survival in this business, and David Harvey (1972) has provided a map of investment potential in inner-city Baltimore, as seen through the eyes of three professional landlords (see Figure 1.11).

The fourth connection between cognitive mapping and spatial behavior recalls our earlier discussion of the human desire to get away from

home in order to see the world. Tourism and cognitive maps are inseparable. We must select the places to visit and map out the routes that we will follow. Help in making these choices is never far away. The tourist advertising industry is geared to manipulating and influencing our cognitive representations of places in the hope that the

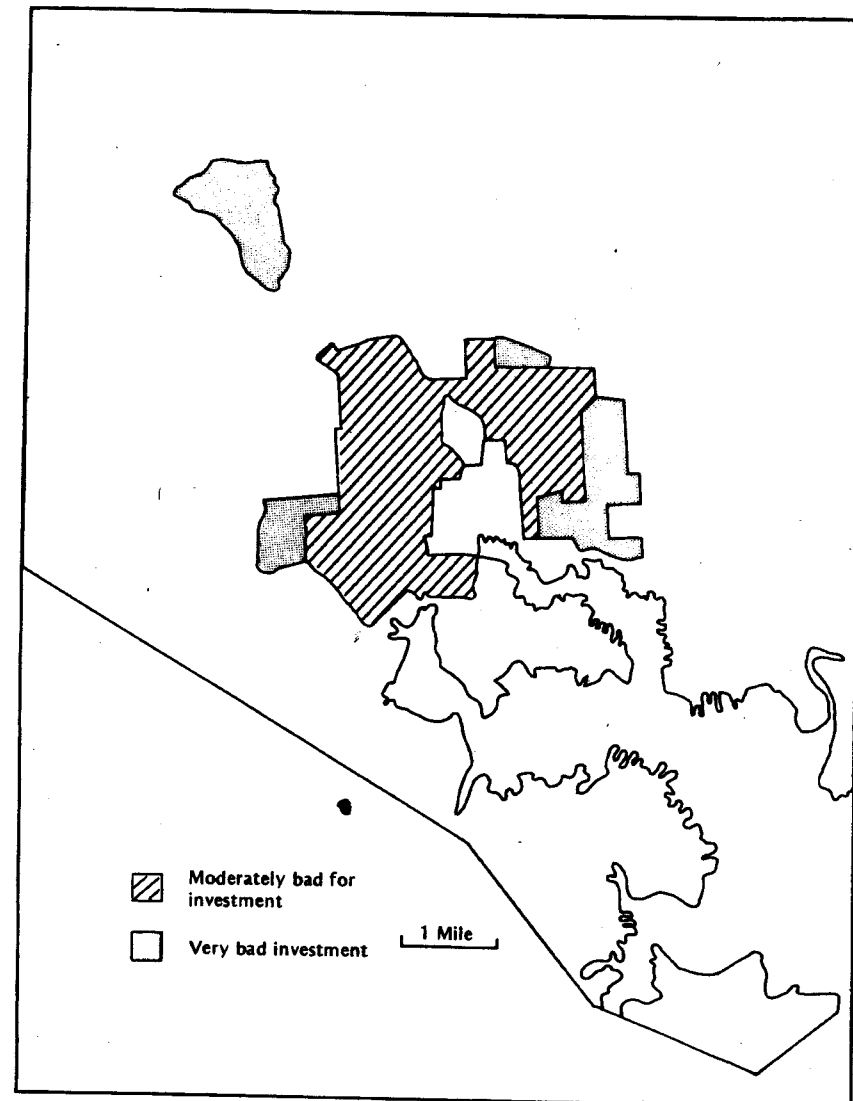


Figure 1.11. Investment possibilities in Baltimore housing as seen by three landlords in 1971.

urge to visit them will prove irresistible. Whether you are the blase world traveller or the confirmed stay-at-home, Florida, the state of excitement, claims to satisfy your every need:

When you have been everywhere and you've seen everything . . . you discover that, after all, there's no place like Florida. When you haven't been anywhere and you haven't seen much, you'll discover that almost everything you've wanted to see is here in FLORIDA.

We are also tempted by the United Airlines map (Figure 1.12), the Greyhound Buslines map (Figure 1.13), and the El Al Airlines montage (Figure 1.14). They draw upon, reinforce, and accentuate our beliefs about vacation spots by singling out memorable graphic symbols that capture the identity of a place: Big Ben for London, the Capitol for Washington, and the Golden Gate Bridge for San Francisco. As we will see in Chapters 3 and 4, the way in which these advertisements are organized, and the "language" that they use, are both paralleled in our own cognitive maps of the world.

Even this brief and highly selective discussion should reveal the fundamental interlinking of cognitive mapping and spatial behavior. Although this argument alone should be sufficient evidence to warrant a detailed investigation of cognitive maps and mapping, there are three other reasons that we must touch on. These are the existence of different perspectives on the world, the practical uses of cognitive mapping, and the role of cognitive mapping in structuring experience.

PERSPECTIVES ON THE WORLD

Cognitive maps and mapping vary according to a person's perspective on the world. Although everybody needs to be able to map the world cognitively in order to survive, the precise nature and use of this ability shows significant variations from person to person. Jakob von Uexkull (1957), an extraordinary ethologist writing in the 1930s, attempted to describe the *umwelten*, or phenomenal worlds, of different living creatures. For creatures ranging from the insects to man, he posed the question, What does the creature sense? The worlds experienced by different species are literally worlds apart. The sensory receptors of each species are sensitive to particular types of information from the surrounding environment: to heat instead of light, to color instead of black-white tones, to shape instead of movement. We sometimes overlook the existence of these "other" worlds because of the natural tendency to anthropomorphize, to attribute to every other creature our own human way of perceiving and cognizing the world. We must not make the same mistake with respect to fellow human beings. Their world may not be identical to our own. The universal need for cogni-

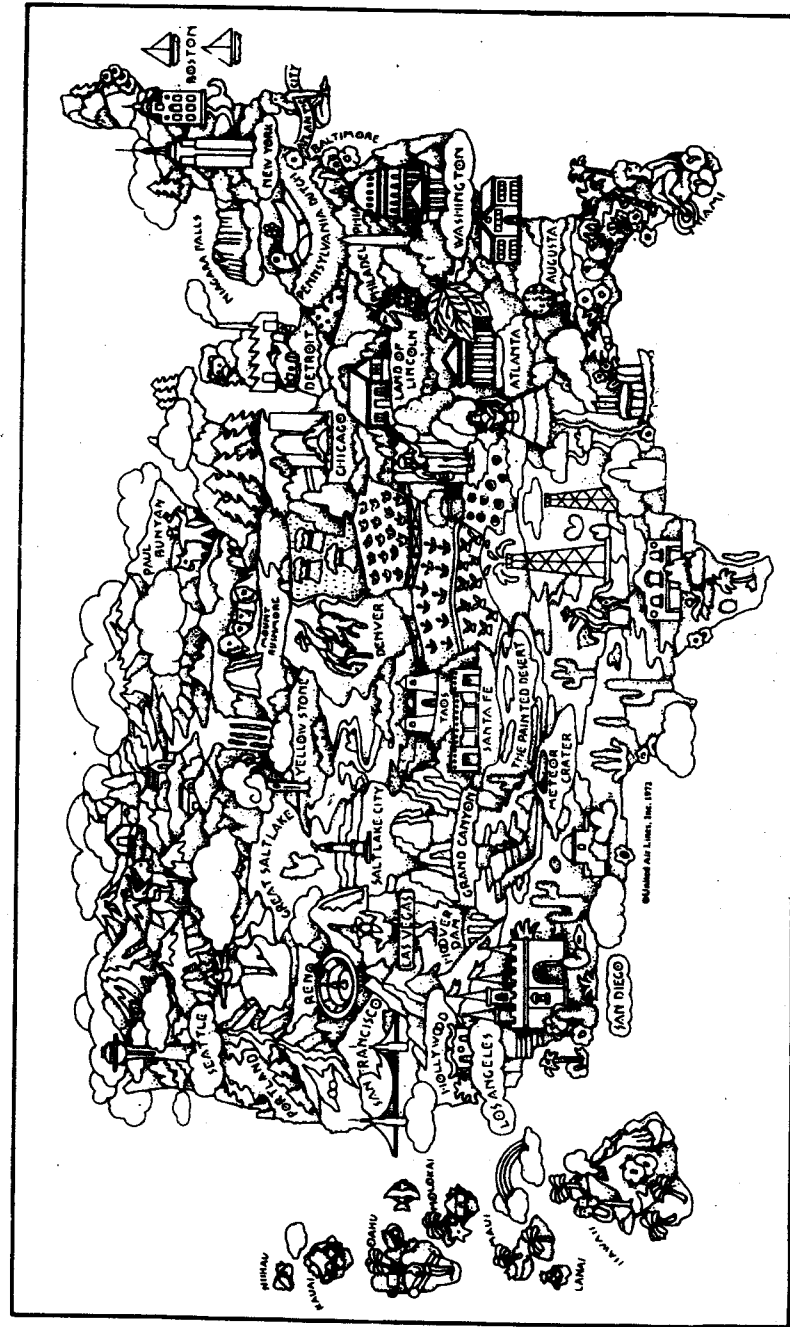


Figure 1.12. "United proudly presents the summer of '72." Selling an image of America, 1: United Air Lines.

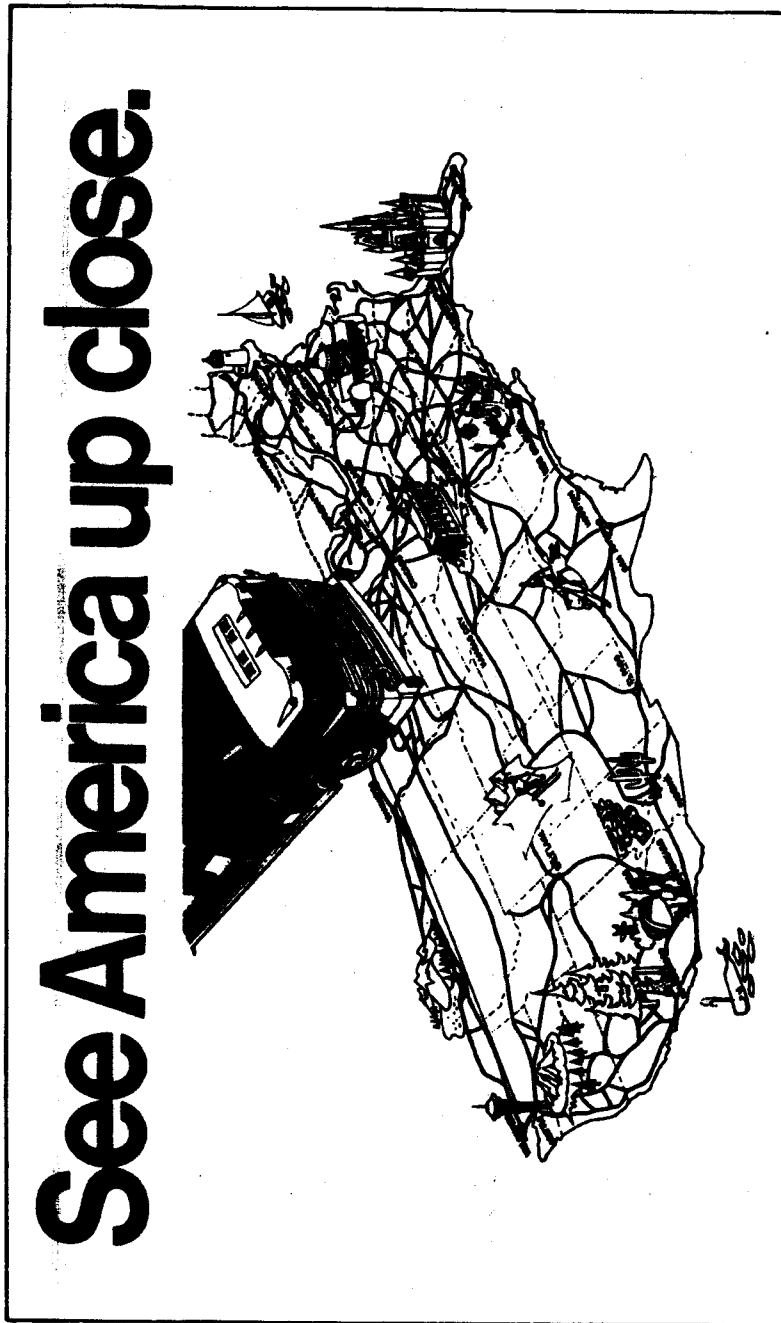


Figure 1.13. Selling an image of America, 2: Greyhound Bus Lines.



Figure 1.14. Selling western Europe: El Al Air Lines.

tive mapping should not be construed to mean either a universal process or a universal product.

Obviously, human beings share sensory receptors with approximately similar physiological capabilities to receive information. However, the world, as we believe it to be, is a synthesis of different types of information: visual, auditory, olfactory, and kinaesthetic. People mix these information types in varying proportions and place greater emphasis on different sensory modes. Consequently, cognitive maps show tremendous individual differences. Blind and deaf people cognitively map their spatial environments and represent the world to themselves. The mapping ability itself follows the same general principles as that of people with full visual and auditory capacities, although the resultant maps differ. Cognitive maps are not necessarily visual pictures of the world. For some people, sounds and smells play as much of a role in the image of a place as do visual inputs. For others, a picture may not be worth one word, let alone a thousand words. Representations do not have to be in the form of sensory images; word pictures can be just as effective. It is all a matter of style, of a choice of perspective on the

world. There is no one universal way of looking at the world that everyone must use. Cognitive mapping is a flexible process that offers us a range of perspectives to suit specific situations.

Perspectives undergo major changes with increasing age; both the ability to map cognitively and the outcome of the process show qualitative developmental changes from birth onwards. The world of the child is not a scaled-down version of the world of adults. As the child passenger and the adult driver discover, there is more than one way to solve a wayfinding problem (see Figure 1.7). To understand the development of cognitive mapping, we must try to see the world through the eyes of a child. And this task is made more difficult because perspectives also change with practice and familiarity. Children and adults alike learn about places, and, as they do so, their representation changes. Eventually the child in the cartoon will learn the direct route from her friend's house to her own home although she hasn't yet made the connection. If the adult driver in the car is a long-term resident of the neighborhood, she will have a very different cognitive map from that of a would-be house purchaser who has just been given the proverbial 10-cent tour by the local realtor. Learning not only affects how much we know, but also how we organize our knowledge. To know somewhere like the back of your hand means more than knowing a lot about a place: It means grasping the complex of relationships between places, people, activities, and routes.

In addition to age and experience, our perspectives on the world are colored by the social group, region, and nation that we identify with. An area that is a run-down slum to a suburban American may be a happy, comfortable, friendly neighborhood to the residents' neighborhood action group. A small area of woodland may be a wildlife sanctuary to conservationists and an investment opportunity to real estate developers. The Texan's map (Figure 1.2) and the Londoner's map (Figure 1.4) are clear expressions of regional bias. In direct contrast to the view from California (Figure 1.10), the Alabama students (Figure 1.15) see residential desirability decreasing all around them although they are tempted by the attractions of California.

All of these variations in perspective emphasize that the world is what we make it, that the world as we believe it to be depends upon our sensory capacities, our age, our experience, and our attitudes and biases. Not only does our spatial behavior depend upon our cognitive mapping ability, but it is also affected by our particular versions and expressions of this ability.

THE PRACTICAL USES OF COGNITIVE MAPPING

Although cognitive mapping forms part of our mysterious "second nature" and is largely out of our immediate awareness, we should recog-

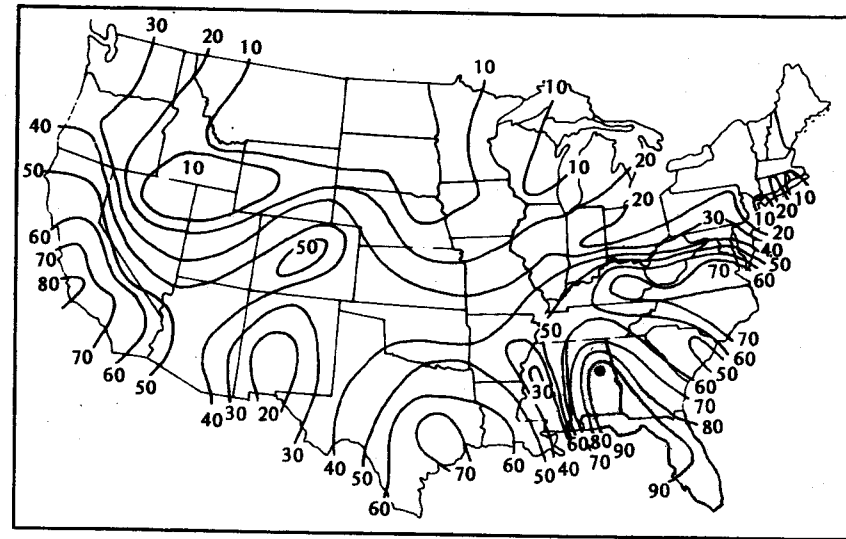


Figure 1.15. Residential desirability, 2: where Alabama students would like (and not like) to live.

nize that it is subject to a series of social pressures which influence and guide and, in some cases, make use of its operation.

Given the fundamental link between cognitive maps and decisions as to what to do where, cognitive maps are a target for advertisers with products and places to sell. Realtors, land speculators, travel agents, resort operators, shopping center developers, and local chambers of commerce are all trying to alter the way that we think about the world around us. But attempts at manipulation are not restricted to such blatant assaults by the advertising industry. Novelists, poets, artists, playwrights, and film directors endeavor to create a setting for their work, a setting that conveys a sense of place. The artistic ability to blend characters and setting draws upon the cognitive mapping skills of both artist and audience. Places "come alive" and we can see the world through the eyes of different characters. Thomas Hardy's Wessex and William Faulkner's Yoknapatawpha County have a reality that transcends our knowledge that they are based upon Dorsetshire and northern Mississippi. For many people throughout the world, America is a land of pony tails, white socks, drive-ins, freeways, skyscrapers, and split-levels—a stereotype constructed from the residual debris of a diet of Hollywood movies and T.V. shows.

Fortunately, there are more responsible sources that promote an understanding of the world. Education, and the discipline of geography in particular, shapes our cognitive maps. However, opinions as to the role

(and value) of geography are many and varied. Mark Twain, speaking through Huckleberry Finn and Tom Sawyer, stated a popular belief about geography—that it is concerned with regional differentiation. Huck, during the flying-boat journey over the U.S.A., shouted:

We're right over Illinois yet . . . Illinois is green, Indiana is pink . . . it ain't no lie, I've seen it on the map, and it's pink.

Tom endorsed this view of the geographer when he replied:

. . . he's got to paint them so you can tell them apart the minute you look at them, hain't he?

(Quoted in Haggett, 1966, p. 3)

Although we may dispute Mark Twain's claims, geography in our schools and colleges does directly "color" (or change and influence) the form and content of cognitive maps and the operation of cognitive mapping. Teachers believe that they are training children to understand the world around them. But, as we shall see in Chapters 6 and 7, cognitive maps are learned, but are largely untaught. The process of learning to understand one's physical world begins before formal schooling. With building blocks and toys, the small child models the world as he believes it to be. The journal, *Better Homes and Gardens*, recently suggested a rainy day blanket game for a child trapped without playmates:

To make the game, take half of an inexpensive blanket and glue on felt cutouts of the areas your youngster knows best—such as shopping center, school, library, airport, Grandma's house. Then the intrepid young traveler can push his toy cars and trucks along the wide highway and start to make-believe.

Children play these games spontaneously, and begin to develop their understanding of the world through their manipulation of models. There is more to toy play than simply idle amusement. An understanding of how this process of cognitive mapping unfolds as children develop is vital if we are to provide toys and teaching programs that are supportive. We must construct exercises that are in tune with the level of cognitive mapping competence that children have attained. At present, such goals are difficult to achieve. We know so little about the development of cognitive mapping in children that we are often guilty of two errors: underestimating the child's ability and, on the other hand, confusing it with that of an adult.

But what of the raw material on which this cognitive mapping process operates? In discussing the importance of understanding the mapping process, we have scarcely mentioned the role of the spatial envi-

ronment itself. In this role lies a distinctly practical justification for the objective of this book. The physical form and arrangement of the environment has a major impact on the success of our efforts at knowing the world. Certain places are easier to comprehend, more readily learned and remembered, and pose fewer wayfinding difficulties. Given this, we can ask what causes these variations. And answers to this question lead directly to the social process of environmental design and planning. Such a goal was at the heart of Kevin Lynch's pioneering book, *The Image of the City*. Lynch argued that environments can be made more legible and imageable. At the city-wide scale, we can recognize the importance of landmarks, while at a smaller scale, urban sign and orientation systems can be designed with cognitive mapping in mind. Within multilevel building complexes, we can provide much-needed cues and signs to assist in wayfinding. Such design tactics are a necessary part of the answer to the poignant request that we should humanize our environment. A human environment is one in which we feel a sense of belonging, a sense of being comfortably at home. And a major part of that feeling rests upon the ability to come to terms with the environment, to be able to comprehend it and move around in it successfully.

OUR PERSONAL WORLD

Beyond all of the strictly utilitarian roles of cognitive mapping lies a more personal reason for understanding the process by which we come to know the world. In some very fundamental but inexpressible way, our own self-identity is inextricably bound up with knowledge of the spatial environment. We can organize personal experience along the twin dimensions of space and time. But the dimensions are inseparable—there can be no personal biography of "what" things happened "when" without a sense of the place in which they happened. Cognitive maps serve as coathangers for assorted memories. They provide a vehicle for recall—an image of "where" brings back a recollection of "who" and "what." This sense of place is essential to any ordering of our lives.

But it provides more than a filing system for coping with the complexities of the past. The ways in which cognitive mapping touches upon ongoing life are many and varied. We solve abstract problems using spatial representations that we can mentally rotate and manipulate. We use spatial mnemonics to recall a sequence of important ideas. We make use of spatial imagery and metaphors in verbal and written communication. We daydream and fantasize about real and imaginary places. As Stephen Spender wrote, "Different living is not living in different places but creating in the mind a map." This process of creating a mental map is essential to our survival in terms of everyday behavior and to our identity as thinking and communicating human beings.